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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/527,351
Filing Date: March 09, 2005
Appellant(s): SUZUKI ET AL.

Randy J. Pritzker
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 23, 2009 appealing from the Office action mailed February 23, 2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

Appeal No. 2008-3273.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is

substantially correct. The changes are as follows:

Claims **1-4, 14 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2).

Claims **6, 10 and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **JP 10-92477** ('477).

Claims **8-9 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **JP 8-51224** ('224).

Claim **11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **Arao et al.** (US Patent No. 5,244,509).

Claim **13** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **Yamada et al.** (US Patent No. 6,566,162 B2).

Claim **15** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **Eisenbeiser et al.** (US Patent Application Publication No. 2003/0015700 A1) and **Arao et al.** (US Patent No. 5,244,509).

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,683,244	FUJIMORI ET AL.	1-2004
10-92477	ARAKAWA ET AL.	4-1998
8-51224	ASHIDA ET AL.	2-1996
5,244,509	ARAO ET AL.	9-1993
6,566,162	YAMADA ET AL.	5-2003
2003/0015700	EISENBEISER ET AL.	1-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

I. Claims **1-4, 14 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2).

Fujimori teaches a photovoltaic element comprising:

(a) a transparent electrode comprising an ITO substrate **3** (= a layer-form (plate-like) first electrode) [col. 7, lines 20-29] and a metallic oxide layer or a derivative layer thereof **8** (= a barrier layer) [col. 12, lines 27-33], the ITO substrate being coated with the metallic oxide layer or derivative layer thereof (= on the top face of the first electrode **3**, a film-like barrier layer **8** is provided) [col. 7, lines 57-60; and Fig. 2], the metallic oxide layer or derivative layer being from 10 nm to 100 nm thick (= about 0.01 to 10 μm = about 10 to 10,000 nm) [col. 12, lines 22-26]; and

(b) a metallic oxide semiconductor layer **4** (= a porous electron transport layer) contacting the metallic oxide layer or derivative layer thereof (= on the top face of the barrier layer **8**) [col. 7, lines 61-63; col. 7, line 66 to col. 8, line 9; and Fig. 2], the metallic oxide semiconductor layer comprising a light sensitizer **4+D** (= a dye layer) [col. 7, lines 61-65; col. 8, lines 40-42; and Fig. 2].

The metallic oxide or derivative thereof includes at least one element among Ti, Cu, Zn, As, Sr, Nb, In, Sn and W (= various kinds of metallic oxides, such as $SrTiO_3$, ZnO, SiO_2. Al_2O_3 and SnO_2) [col. 12, lines 27-33].

The photovoltaic element further comprises a metallic oxide semiconductor **4** (col. 7, line 66 to col. 8, line 9) carrying a dye **D** (col. 9, line 13 to col. 10, line 10) as an electrode of a dye-sensitized type solar cell (col. 8, lines 33-58; and Fig. 2).

The metallic oxide layer or derivative layer thereof comprises tin (= tin oxide (SnO_2)) [col. 12, lines 27-33].

The element of Fujimori differs from the instant invention because Fujimori does not disclose the following:

a. Wherein *the transparent electrode has a resistance* of about 5 Ω/cm^2, as recited in claim ***1***.

Fujimori teaches a transparent electrode comprising an ITO substrate **3** (= a layer-form (plate-like) first electrode) [col. 7, lines 20-29] and a metallic oxide layer or a derivative layer thereof **8** (= a barrier layer) [col. 12, lines 27-33].

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Fujimori teaches the same transparent electrode as presently claimed. Similar structures can reasonably be expected to inherently have the same properties.

Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical process, *a prima facie* of either anticipation or obviousness has been established (MPEP § 2112.01(I)).

b. Wherein when the metallic oxide or derivative layer thereof *is held* for one hour in atmospheric air at 500°C, the rise of a resistance value is 10 Ω/cm^2 or lower, as recited in claim ***3***.

Fujimori teaches a metallic oxide layer or a derivative layer thereof **8** (= a barrier layer) [col. 12, lines 27-33].

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Fujimori teaches the same metallic oxide as presently claimed. A compound and all of its properties are inseparable. *In re Papesch*, 315 F.2d 381, 391, 137 USPQ 43, 51 (CCPA 1963) [MPEP § 2141.02(V)].

Furthermore, holding the metallic oxide for one hour in atmospheric air at 500°C is a process limitation. Process limitations do not structurally distinguish the element from the prior art.

c. Wherein *a light transmittance* of the ITO substrate coated with the metallic oxide or derivative thereof, in the wavelength range from 400 nm to 900 nm, is 60% or higher, as recited in claim ***4***.

Fujimori teaches a transparent electrode comprising an ITO substrate **3** (= a layer-form (plate-like) first electrode) [col. 7, lines 20-29] and a metallic oxide layer or a derivative layer thereof **8** (= a barrier layer) [col. 12, lines 27-33].

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Fujimori teaches the same transparent electrode as presently claimed. Similar structures can reasonably be expected to inherently have the same properties.

Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical process, *a prima facie* of either anticipation or obviousness has been established (MPEP §

2112.01(I)).

d. Wherein the metallic oxide layer or derivative layer thereof comprises fluorine-doped conductive glass, as recited in claim ***14***.

Fujimori teaches:

"The constituent material of the barrier layer **8** is not limited particularly, but in addition to titanium oxide which is the principal material for the electron transport layer **4**, *various kinds of metallic oxide, such as $SrTiO_3$, ZnO, SiO_2, Al_2O_3 and SnO_2*, and various kinds of metallic compounds such as CdS, CdSe, TiC, Si_3N_4, SiC, B_4N and BN, for example, may be used. In this case, one kind or a combination of two or more kinds of these materials may be used. Among these materials, *a material having electrical conductivity equivalent to that of the electron transport layer **4** is particularly preferred for the constituent material for the barrier layer **8***, and a material having titanium oxide as its principal constituent is more preferred. By constituting the barrier layer **8** with such a material, it is possible to transmit electrons generated in the dye layer **D** to the barrier layer **8** with high efficiency. As a result, the power generation efficiency of the solar cell **1A** can further be enhanced" (col. 12, lines 27-33).

Fujimori teaches that the barrier layer is preferably a material having electrical conductivity equivalent to that of the electron transport layer.

Fujimori teaches that the electron transport layer includes tin oxide (SnO_2) [col. 7, line 66 to col. 8, line 9].

Fujimori teaches that tin oxide (SnO_2) and fluorine-doped tin oxide (FTO) are functionally equivalent materials (col. 7, lines 20-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the metallic oxide layer or derivative layer thereof described by Fujimori with wherein the metallic oxide layer or derivative layer thereof comprises fluorine-doped conductive glass because fluorine-doped tin oxide (FTO)

would have been functionally equivalent to tin oxide (SnO_2) as taught by Fujimori (col. 7, lines 20-29).

The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution. *Ex parte Novak* 16 USPQ 2d 2041 (BPAI 1989); *In re Leshin* 125 USPQ 416; *Lyon v. Bausch & Lomb* 106 USPQ 1; *Graver Tank & Manufacturing Co. V. Linde Air Products Co.* 85 USPQ 328 (Supr. Ct.) [MPEP § 2144.07].

II. Claims **6, 10 and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **JP 10-92477** ('477).

Fujimori is as applied above and incorporated herein.

The element of Fujimori differs from the instant invention because Fujimori does not disclose the following:

a. • Wherein the metallic oxide semiconductor layer <u>*is sintered*</u> on the transparent electrode, as recited in claim ***6***.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because sintering the metallic oxide semiconductor layer on the transparent electrode is a process limitation. Process limitations do not structurally distinguish the element from the prior art.

Furthermore, ***JP '477*** teaches that an oxide semiconductor film being formed

from fired material of an oxide semiconductor particle aggregate and having a thickness of at least 10 nm has raised mechanical strength and strong adherence to a substrate (page 7, lines 2-6).

• Wherein *the metallic oxide layer or derivative layer thereof* prevents the resistance of the transparent electrode from rising more than 10 Ω/cm^2 *when* the metallic oxide semiconductor layer is sintered on the transparent electrode, as recited in claim ***6***.

Fujimori teaches that on the top face of the barrier layer **8**, there are provided a porous electron transport layer **4** and the dye layer **D** which is in contact with the electron transport layer (col. 7, lines 61-63; and Fig. 2).

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Fujimori teaches the same metallic oxide semiconductor layer and the metallic oxide layer or derivative layer thereof as presently claimed. Similar structures can reasonably be expected to inherently have the same properties.

Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical process, *a prima facie* of either anticipation or obviousness has been established (MPEP § 2112.01(I)).

b. Wherein the metallic oxide layer or derivative layer thereof comprises

niobium, as recited in claim ***10***.

c. Wherein the metallic oxide layer or derivative layer thereof comprises calcium, as recited in claim ***12***.

Fujimori teaches:

"The constituent material of the barrier layer **8** is not limited particularly, but in addition to titanium oxide which is the principal material for the electron transport layer **4**, *various kinds of metallic oxide, such as $SrTiO_3$, ZnO, SiO_2, Al_2O_3 and SnO_2*, and various kinds of metallic compounds such as CdS, CdSe, TiC, Si_3N_4, SiC, B_4N and BN, for example, may be used. In this case, one kind or a combination of two or more kinds of these materials may be used. Among these materials, a material having electrical conductivity equivalent to that of the electron transport layer **4** is particularly preferred for the constituent material for the barrier layer **8**, and a material having titanium oxide as its principal constituent is more preferred. By constituting the barrier layer **8** with such a material, it is possible to transmit electrons generated in the dye layer **D** to the barrier layer **8** with high efficiency. As a result, the power generation efficiency of the solar cell **1A** can further be enhanced" (col. 12, lines 27-33).

Like Fujimori, ***JP '477*** teaches solar cells. JP '477 teaches oxide semiconductors such as perovskite systems, such as *$SrTiO_3$* and *Ca*TiO_3, besides the *oxide of* transition metals, such as Ti, *Nb*, Zn, *Sn*, Zr, Y, La and Ta, etc. (page 2, [0005]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the metallic oxide layer or derivative layer thereof described by Fujimori with (b) and (c) above because a metallic oxide layer or derivative layer thereof of niobium and calcium would have been functionally equivalent to $SrTiO_3$, ZnO and SnO_2 as taught by JP '477 (page 2, [0005]).

III. Claims **8-9 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and

17 above, and further in view of **JP 8-51224** ('224).

Fujimori is as applied above and incorporated herein.

The element of Fujimori differs from the instant invention because Fujimori does not disclose the following:

a. Wherein the metallic oxide layer or derivative layer thereof comprises copper, as recited in claim ***8***.

b. Wherein the metallic oxide layer or derivative layer thereof comprises tungsten, as recited in claim ***9***.

c. Wherein the metallic oxide layer or derivative layer thereof comprises indium, as recited claim ***16***.

Fujimori teaches:

"The constituent material of the barrier layer **8** is not limited particularly, but in addition to titanium oxide which is the principal material for the electron transport layer **4**, *various kinds of metallic oxide, such as $SrTiO_3$, ZnO, SiO_2, Al_2O_3 and SnO_2*, and various kinds of metallic compounds such as CdS, CdSe, TiC, Si_3N_4, SiC, B_4N and BN, for example, may be used. In this case, one kind or a combination of two or more kinds of these materials may be used. Among these materials, a material having electrical conductivity equivalent to that of the electron transport layer **4** is particularly preferred for the constituent material for the barrier layer **8**, and a material having titanium oxide as its principal constituent is more preferred. By constituting the barrier layer **8** with such a material, it is possible to transmit electrons generated in the dye layer **D** to the barrier layer **8** with high efficiency. As a result, the power generation efficiency of the solar cell **1A** can further be enhanced" (col. 12, lines 27-33).

Like Fujimori, ***JP '224*** teaches photoelectric conversion elements. JP '224 teaches that the device comprises a substrate, a transparent oxide electrode, a metal oxide layer, a substantially intrinsic semiconductor thin film, a n-type semiconductor thin film and an electrode (abstract). The metal oxide layer used comprises *indium oxide*

(In_2O_3), *zinc oxide (ZnO)*, titanium oxide (TiO_2), *tungstic oxide (WO_2)*, nickel oxide (NiO), *copper oxide (CuO, CuO_2)* and iridium oxide (IrO_2) [page 4, [0011]].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the metallic oxide layer or derivative layer thereof described by Fujimori with (a) to (c) above because a metallic oxide layer or derivative layer thereof of copper, tungsten and indium would have been functionally equivalent to ZnO as taught by JP '224 (page 4, [0011]).

IV. Claim **11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **Arao et al.** (US Patent No. 5,244,509).

Fujimori is as applied above and incorporated herein.

The element of Fujimori differs from the instant invention because Fujimori does not disclose wherein the metallic oxide layer or derivative layer thereof comprises antimony, as recited in claim ***11***.

Fujimori teaches:

"The constituent material of the barrier layer **8** is not limited particularly, but in addition to titanium oxide which is the principal material for the electron transport layer **4**, *various kinds of metallic oxide, such as $SrTiO_3$, ZnO, SiO_2, Al_2O_3 and SnO_2*, and various kinds of metallic compounds such as CdS, CdSe, TiC, Si_3N_4, SiC, B_4N and BN, for example, may be used. In this case, one kind or a combination of two or more kinds of these materials may be used. Among these materials, a material having electrical conductivity equivalent to that of the electron transport layer **4** is particularly preferred for the constituent material for the barrier layer **8**, and a material having titanium oxide as its principal constituent is more preferred. By constituting the barrier layer **8** with such a material, it is possible to transmit electrons generated in the dye layer **D** to the barrier

layer **8** with high efficiency. As a result, the power generation efficiency of the solar cell **1A** can further be enhanced" (col. 12, lines 27-33).

Like Fujimori, ***Arao*** teaches solar cells. Arao teaches that the buffer layer is composed of a material selected from a material containing magnesium fluoride as the principal component, *oxides*, nitrides and carbides *of* indium, *tin*, cadmium, *zinc*, *antimony*, *silicon*, chromium, silver, copper, *aluminum* or magnesium (col. 5, lines 1-6).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the metallic oxide layer or derivative layer thereof described by Fujimori with wherein the metallic oxide layer or derivative layer thereof comprises antimony because a metallic oxide layer or derivative layer thereof of antimony would have been functionally equivalent to SnO_2, ZnO, SiO_2 and Al_2O_3 as taught by Arao (col. 5, lines 1-6).

V. Claim **13** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **Yamada et al.** (US Patent No. 6,566,162 B2).

Fujimori is as applied above and incorporated herein.

The element of Fujimori differs from the instant invention because Fujimori does not disclose wherein the metallic oxide layer or derivative layer thereof comprises gallium, as recited in claim ***13***.

Like Fujimori, ***Yamada*** teaches solar cells. Yamada teaches a buffer layer or layers of *gallium oxide* and/or indium oxide (col. 4, lines 17-22 and 38-46; and Fig. 7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the metallic oxide layer or derivative layer thereof described by Fujimori with wherein the metallic oxide layer or derivative layer thereof comprises gallium because a metallic oxide layer or derivative layer thereof of gallium would have been functionally equivalent as a buffer layer in a solar cell as taught by Yamada (col. 4, lines 17-22 and 38-46; and Fig. 7).

It has been held that the selection of a known material based on its suitability for its intended use supports a *prima facie* obviousness determination (MPEP § 2144.06 and § 2144.07).

VI. Claim **15** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Fujimori et al.** (US Patent No. 6,683,244 B2) as applied to claims 1-4, 14 and 17 above, and further in view of **Eisenbeiser et al.** (US Patent Application Publication No. 2003/0015700 A1) and **Arao et al.** (US Patent No. 5,244,509).

Fujimori is as applied above and incorporated herein.

The element of Fujimori differs from the instant invention because Fujimori does not disclose wherein the metallic oxide layer or derivative layer thereof comprises arsenic, as recited in claim ***15***.

Like Fujimori, ***Eisenbeiser*** teaches solar cells. Eisenbeiser teaches that a suitable template for a buffer layer includes strontium-oxide-*arsenic* (Sr-O-As) [page 4, [0048]].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the metallic oxide layer or derivative layer thereof described by Fujimori with wherein the metallic oxide layer or derivative layer thereof comprises arsenic because a metallic oxide layer or derivative layer thereof of arsenic would have been functionally equivalent as a buffer layer in a solar cell as taught by Eisenbeiser (page 4, [0048]).

It has been held that the selection of a known material based on its suitability for its intended use supports a *prima facie* obviousness determination (MPEP § 2144.06 and § 2144.07).

Furthermore, ***Arao*** teaches solar cells. Arao teaches that the buffer layer is composed of a material selected from a material containing magnesium fluoride as the principal component, *oxides*, nitrides and carbides *of* indium, tin, cadmium, zinc, *antimony*, silicon, chromium, silver, copper, aluminum or magnesium (col. 5, lines 1-6).

Arsenic is also a Group VB element as antimony. One having ordinary skill in the art would have expected that the substitution of one Group VB element for another would have been functionally equivalent.

(10) Response to Argument

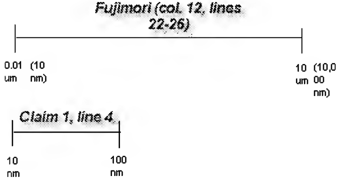
1. The Claimed Range is Not Anticipated by Fujimori.

It should be noted that the same claimed range was argued in the previous Appeal (Appeal No. 2008-3273) in this application, which the subject matter

thereof was affirmed by the Board.

Appellants state that Fujimori's broad thickness range of 10 nm to 10,000 nm is one hundred times larger than Applicants' claimed range. Fujimori's thickness range spans three orders of magnitude, which is the same relative distance between a meter and a kilometer. *Fujimori's range disclosure is not sufficiently specific to anticipate Applicants' claimed range*.

In response, Fujimori's broad thickness range of 10 nm to 10,000 nm encompasses the claimed thickness range of 10 nm to 100 nm:



When, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is "anticipated" if *one of them* is in the prior art (MPEP § 2131.03). *Ninety values* (10 nm to 100 nm) are taught by Fujimori (col. 12, lines 22-26).

A prior art reference must be considered in its entirety, i.e., as a *whole*, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc.*

V. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. Denied,* 469 U.S. 851 (1984). Further, a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments, see *Merck & Co. v. Biocraft Laboratories,* 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), *cert. denied,* 493 U.S. 975 (1989). See MPEP § 2123, § 2141.02, and § 2145(X)(D)(1).

What constitutes a "sufficient specificity" is fact dependent (MPEP § 2131.03). However, disclosed *examples* and *preferred embodiments* do not constitute a teaching away from a broader disclosure or nonpreferred embodiments (MPEP § 2123 (II)).

Appellants state that the fact that Applicants' claimed range is within Fujimori's broad range is not enough to establish anticipation.

In response, when, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is "anticipated" if *one of them* is in the prior art (MPEP § 2131.03).

2. The Claimed Range is Not Prima Facie Obvious in View of Fujimori.

Appellants state that Fujimori's broad thickness range of 10 nm to 10,000 nm is too broad to establish a *prima facie* case of obviousness for Applicants' much narrower claimed range of 10 nm to 100 nm.

In response, the claimed thickness range of 10 nm to 100 nm *lies inside* Fujimori's broad thickness range of 10 nm to 10,000 nm. In the case where the claimed

ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists (MPEP § 2144.05(I)).

Appellants state that the present application is analogous to Baird because Fujimori's broadest thickness range is extremely broad, spanning a range of 10 nm to 10,000 nm, one hundred times larger than Applicants' claimed range. The Baird court recognized that the disclosure of *a large genus does not render obvious a claim to a small species*, particularly when that disclosure indicates a preference leading away from the claimed compounds. Id at 383. As in Baird, Fujimori's disclosure indicates *a preference* for thicker layers that fall outside the claimed thickness range. Fujimori discloses a preference for a thickness range between 500 nm and 2000 nm (0.5 μm to 2 μm) to achieve the best results for short circuit prevention. (Col. 12, lines 22-25). Given the extremely large breadth of Fujimori's thickness range between 10 nm to 10,000 nm one of ordinary skill in the art would look for further guidance from Fujimori to select an appropriate thickness. Fujimori provides much more specific guidance: Fujimori states that *the best results can be achieved* with a thicknesses between 500 nm and 2000 nm, and provides several examples of specific embodiments, all of which fall well outside of Applicants' claimed thickness range.

In response, a prior art reference must be considered in its entirety, i.e., as a *whole*, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. V. Garlock, Inc.,* 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert.*

Denied, 469 U.S. 851 (1984). Further, a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art, including nonpreferred embodiments, see *Merck & Co. v. Biocraft Laboratories,* 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), *cert. denied,* 493 U.S. 975 (1989). See MPEP § 2123, § 2141.02, and § 2145(X)(D)(1).

Disclosed *examples* and *preferred embodiments* do not constitute a teaching away from a broader disclosure or nonpreferred embodiments (MPEP § 2123 (II)).

Furthermore, an inoperativeness of a reference is not established by merely showing that a particular disclosed embodiment is lacking in perfection does not establish non-obviousness. *Ex parte Allen* 2 USPQ 2d 1425 (BPAI 19870; *Decca Ltd. V. United States* 191 USPQ 439 (Ct. Cl. 1976); *Bennett v. Halahan* 128 USPQ 398, 401 (CCPA 1961).

3. The Claimed Resistance is Not Disclosed by, or Obvious in View of, Fujimori et al.

Appellants state that *Fujimori does not support the conclusion that a resistance of about 5 Ω/cm² is necessarily created by Fujimori's electrode 3 and barrier layer 8*. Fujimori states that the electrode 3 and barrier layer 8 may have many different thicknesses, *which could cause* the resistance value to change significantly. Fujimori states that the thickness of the electrode 3 can be between 50 nm and 5,000 nm (from 0.05 μm to 5 μm), which is a thickness range spanning three orders of magnitude (Col.

7, lines 33-37). Fujimori states that barrier layer 8 has a thickness range that extends from 10 nm to 10,000 nm (0.01 μm to 10 μm), which also spans three orders of magnitude. The total resistance through barrier layer 8 and electrode 3 _could be very different_ depending on the thickness of these layers.

In response, present claim 1, lines 1-7, recite:

"A photovoltaic element comprising:
- ***a transparent electrode*** comprising:
  - an ITO substrate and
  - a metallic oxide layer or a derivative layer thereof,

the ITO substrate being coated with the metallic oxide layer or derivative layer thereof, the metallic oxide layer or derivative layer being from 10nm to 100nm thick, ***the transparent electrode*** _having a resistance of about 5 Ω/cm^2_; and
- a metallic oxide semiconductor layer contacting the metallic oxide layer or derivative layer thereof, the metallic oxide semiconductor layer comprising a light sensitizing dye."

Fujimori teaches:
- ***a transparent electrode*** comprising:
  - an ITO substrate **3** (= a layer-form (plate-like) first electrode) [col. 7, lines 20-29] and
  - a metallic oxide layer or a derivative layer thereof **8** (= a barrier layer) [col. 12, lines 27-33],

the ITO substrate being coated with the metallic oxide layer or derivative layer thereof (= on the top face of the first electrode **3**, a film-like barrier layer **8** is provided) [col. 7, lines 57-60; and Fig. 2], the metallic oxide layer or derivative layer being from 10 nm to 100 nm thick (= about 0.01 to 10 μm = about 10 to 10,000 nm) [col. 12, lines 22-26], ***the transparent electrode*** having a resistance.

Fujimori is silent to the resistance of the transparent electrode (i.e., a laminate of the ITO substrate 3 and metallic oxide layer 8). However, Fujimori teaches the same

transparent electrode structure as presently claimed. Therefore, one having ordinary skill in the art would have expected that the transparent electrode structure taught by Fujimori would have possessed similar abilities and properties as the claimed transparent electrode, including having a resistance of about 5 Ω/cm^2, because these abilities and properties would have been inseparable in materials that are chemically and structurally the same. *In re Papesch*, 315 F.2d 381, 391, 137 USPQ 43, 51 (CCPA 1963) [MPEP § 2141.02(V)].

Appellants state that <u>*Fujimori also describes many different materials that may be used for barrier layer 8 (Col. 2, lines 27-43), each of which may have a different resistivity*</u>. Furthermore, Fujimori states that barrier layer 8 can be porous, with a porosity up to 20% (Col. 2, lines 14-18) The resistance of barrier layer 8 may change significantly depending on the porosity. One of ordinary skill in the art would expect the resistance value to change significantly as a function of significant variations in thicknesses, materials and porosity. <u>*The Office Action has not established that all of these variables result in a resistance that must be about 5 Ω/cm^2*</u>. Quite to the contrary, Fujimori's various thicknesses, materials and porosities should produce many different resistance values as these variables are changed.

In response, present claim 2, lines 1-3, recites many different materials that may be used for the metallic oxide layer or derivative layer thereof:

"The photovoltaic element according to claim 1, wherein the <u>*metallic oxide*</u> layer or derivative layer thereof <u>*includes*</u> at least one element among <u>*Ti, Cu, Zn, As, Sr, Nb,*</u>

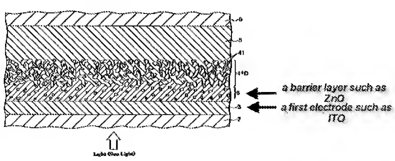
In, Sn and W."

Fujimori teaches that:

The constituent material of the barrier layer 8 is not limited particularly, but in addition to titanium oxide which is the principal material for the electron transport layer 4, *various kinds of metallic oxide, such as $SrTiO_3$, ZnO, SiO_2, Al_2O_3 and SnO_2*, and various kinds of metallic compounds such as CdS, CdSe, TiC, Si_3N_4, SiC, B_4N and BN, *for example, may be used*. In this case, one kind or a combination of two or more kinds of these materials may be used. Among these materials, a material having electrical conductivity equivalent to that of the electron transport layer 4 is particularly preferred for the constituent material for the barrier layer 8, and a material having titanium oxide as its principal constituent is more preferred. By constituting the barrier layer 8 with such a material, it is possible to transmit electrons generated in the dye layer D to the barrier layer 8 with high efficiency. As a result, the power generation efficiency of the solar cell 1A can further be enhanced (col. 12, lines 27-43).

Fujimori teaches a metallic oxide layer or derivative layer thereof comprising similar claimed elements. A compound and all of its properties are inseparable. *In re Papesch*, 315 F.2d 381, 391, 137 USPQ 43, 51 (CCPA 1963) [MPEP § 2141.02(V)].

The transparent electrode disclosed by Fujimori is structurally, physically and materially the same as the transparent electrode as presently claimed:



(Fig. 2).

Products of identical chemical composition can not have mutually exclusive properties.

Appellants state that when ITO is used at the transparent electrode material, the resistance can rise significantly when exposed to high temperature in the manufacturing process (Page 3, ¶2, Table 1). Fujimori states that a high-temperature sintering process is used to form the electron transport layer 4 (Col. 18, lines 48-57). If barrier layer 8 is unsuitable for protecting Fujimori's electrode from acid, then the resistance of Fujimori's electrode would rise well above 5 Ω/cm^2 during the manufacturing process. _Fujimori provides absolutely no suggestion that barrier layer 8 is capable of preventing such a rise in the resistance of ITO during the sintering process_.

In response, present claim 2, lines 1-3, recites:

"The photovoltaic element according to claim 1, wherein the _metallic oxide_ layer or derivative layer thereof _includes_ at least one element among _Ti, Cu, Zn, As, Sr, Nb, In, Sn and W_."

Fujimori teaches that:

The constituent material of the barrier layer 8 is not limited particularly, but in addition to titanium oxide which is the principal material for the electron transport layer 4, _various kinds of metallic oxide, such as $SrTiO_3$, ZnO, SiO_2, Al_2O_3 and SnO_2_, and various kinds of metallic compounds such as CdS, CdSe, TiC, Si_3N_4, SiC, B_4N and BN, _for example, may be used_. In this case, one kind or a combination of two or more kinds of these materials may be used. Among these materials, a material having electrical conductivity equivalent to that of the electron transport layer 4 is particularly preferred for the constituent material for the barrier layer 8, and a material having titanium oxide as its principal constituent is more preferred. By constituting the barrier layer 8 with such a material, it is possible to transmit electrons generated in the dye layer D to the barrier layer 8 with high efficiency. As a result, the power generation efficiency of the solar cell 1A can further be enhanced (col. 12, lines 27-43).

Fujimori teaches a metallic oxide layer or derivative layer thereof comprising similar claimed elements. A compound and all of its properties are inseparable. *In re*

Papesch, 315 F.2d 381, 391, 137 USPQ 43, 51 (CCPA 1963) [MPEP § 2141.02(V)].

One having ordinary skill in the art would have expected that the metallic oxide layer taught by Fujimori would have possessed similar abilities and properties as presently claimed, including being capable of preventing a rise in the resistance of ITO during a sintering process, because these abilities and properties would have been inseparable in materials that are chemically the same. *In re Papesch*, 315 F.2d 381, 391, 137 USPQ 43, 51 (CCPA 1963) [MPEP § 2141.02(V)].

4. Fujimori Teaches Away From the Claimed Invention

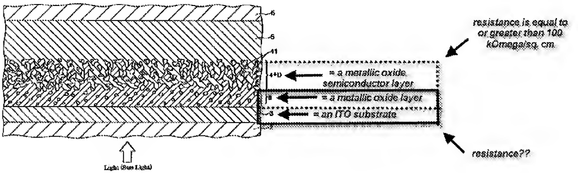
Appellants state that Fujimori et al. states that it is preferable that barrier layer 8 have a higher resistance in the thickness direction to more reliably prevent or suppress short circuits (Col. 2, lines 55-60). For example, Fujimori states that the resistance in the thickness direction of the barrier layer 8 and the electron transport layer 4 is preferably larger than 100 Ω/cm^2, and more preferably larger than 1 kΩ/cm^2 (Col. 12, lines 44-55). *Although Fujimori does not specify the resistance of the barrier 8 alone*, Fujimori states that the barrier layer preferably has an electric conductivity substantially the same as the electron transport layer 4 (Col. 2, lines 31-35). *Assuming for the sake of argument* that barrier layer 8 and electron transport layer 4 each contribute half of the total resistance of 100 Ω /cm, the barrier layer 8 would have a resistance of 50 Ω /cm^2. This resistance value of 50 Ω /cm^2 for barrier 8 alone is well above the claimed resistance value of 5 Ω/cm^2 for the transparent electrode as a whole. One of ordinary skill in the art

would not reduce the resistance of barrier layer 8 to a significantly lower value because doing so would be contrary to Fujimori's stated purpose of preventing short circuits.

In response, Fujimori teaches that:

Further, it is also _preferred_ that the resistance value in the thickness direction of _the total_ of the barrier layer and the electron transport layer _is equal to or greater than 100 kΩ/cm^2_. This makes it possible to prevent or suppress the short-circuiting between the first electrode and the hole transport layer more reliably (col. 2, lines 55-60; and Fig. 2:

Fig. 2



).

The resistance of the metallic oxide semiconductor layer would have been calculated to be higher than the metallic oxide layer because the metallic oxide semiconductor layer is _semiconducting_. A semiconductor is a material that has an electrical resistivity between that of a conductor and an insulator. Thus, the resistivity of the metallic oxide layer would have always been less than the resistivity of the metallic oxide semiconductor layer.

And from the teachings of Fujimori:

- ***a transparent electrode*** comprising:
  - an ITO substrate **3** (= a layer-form (plate-like) first electrode) [col. 7, lines 20-29] and
  - a metallic oxide layer or a derivative layer thereof **8** (= a barrier layer) [col. 12, lines 27-33],

  the ITO substrate being coated with the metallic oxide layer or derivative layer thereof (= on the top face of the first electrode **3**, a film-like barrier layer **8** is provided) [col. 7, lines 57-60; and Fig. 2], the metallic oxide layer or derivative layer being from 10 nm to 100 nm thick (= about 0.01 to 10 μm = about 10 to 10,000 nm) [col. 12, lines 22-26], ***the transparent electrode*** having a resistance,

there is no reason why this transparent electrode does not have a resistance of about 5 Ω/cm^2.

Appellants state that the purpose of Fujimori's barrier layer 8 is to provide electrical isolation, not chemical protection of an underlying ITO substrate. There is no evidence that Fujimori's barrier layer would have provided adequate chemical protection of ITO. For these reasons, the present invention produces a new and unexpected result, and is patentable over Fujimori.

In response, the Appellants have a different reason for, or advantage resulting from doing what the prior art relied upon has suggested, it is noted that it is well settled that this is not demonstrative of nonobviousness. *In re Kronig* 190 USPQ 425, 428 (CCPA 1976); *In re Linter* 173 USPQ 560 (CCPA 1972); the prior art motivation or advantage may be different than that of Appellants while still supporting a conclusion of obviousness. *In re Wiseman* 201 USPQ 658 (CCPA 1979); *Ex parte Obiaya* 227 USPQ

58 (Bd. of App. 1985) and MPEP § 2144.

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are provided herein.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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